AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A rotation angle calculating method of a wire harness, in which a rotation angle of the wire harness is calculated at an arbitrary measuring point of the wire harness when the wire harness is deformed from a first shape to a second shape while a fixed point of the wire harness is fixed, the rotation angle calculating method, comprising the steps of:

setting a plurality of intermediate points between the fixed point and the measuring point of the wire harness in the second shape, wherein the fixed point, the measuring point and the intermediate points are set as nodes respectively;

setting vectors tangent to the wire harness at the nodes of the wire harness in the second shape as node vectors respectively;

calculating angles, each of which has a rotation direction, wherein each of the angles is defined between the node vectors at the adjoining nodes;

adding the angles to each other so as to calculate a rotation angle having a rotation direction at the measuring point; and

recording said rotation angle.

2. (original): The rotation angle calculating method as set forth in claim 1, wherein the vectors at the nodes of the wire harness in the second shape are tangent vectors.

3. (original): The rotation angle calculating method as set forth in claim 1, further comprising the steps of:

setting a tangent vector at the measuring point of the wire harness in the first shape as a reference tangent vector; and

setting a tangent vector at the measuring point of the wire harness in the second shape as a final tangent vector,

wherein the vectors at the intermediate points of the nodes of the wire harness in the second shape are sequence of points vectors which are obtained from lines connecting the respective adjoining nodes of the wire harness in the second shape; and

wherein in the angles calculating step, an angle defined between the reference tangent vector and the sequence of points vector at the fixed point as a starting point, an angle having a rotation angle, which is defined between the respective sequence of points vectors at the respective adjoining intermediate points of the nodes as starting points; and an angle having a rotation angle, which is defined between the sequence of points vector directed to the measuring point and the final tangent vector are calculated.

4. (original): The rotation angle calculating method as set forth in claim 2, further comprising the steps of:

setting a virtual shape having a linear shape which extends in a direction of a tangent vector at the fixed point in a case that both the first shape and the second shape of the wire harness are non-linear shapes;

calculating a first rotation angle at the measuring point in a case that the wire harness is deformed from the virtual shape to the first shape while the fixed point of the wire harness is fixed by performing the node setting step, the vector setting step, the angles calculating step and the angles adding step;

calculating a second rotation angle at the measuring point in a case that the wire harness is deformed from the virtual shape to the second shape while the fixed point of the wire harness is fixed by performing the node setting step, the vector setting step, the angles calculating step and the angles adding step; and

calculating a rotation angle having the rotation direction at the measuring point in a case that the wire harness is deformed from the first shape to the second shape based on the first and second rotation angles.

5. (original): The rotation angle calculating method as set forth in claim 3, further comprising:

setting a virtual shape having a linear shape which extends in a direction of a tangent vector at the fixed point in a case that both the first shape and the second shape of the wire harness are non-linear shapes;

calculating a first rotation angle at the measuring point in a case that the wire harness is deformed from the virtual shape to the first shape while the fixed point of the wire harness is fixed by performing the node setting step, the vector setting step, the reference tangent vector

setting step, the final tangent vector setting step, the angles calculating step and the angles adding step;

calculating a second rotation angle at the measuring point in a case that the wire harness is deformed from the virtual shape to the second shape while the fixed point of the wire harness is fixed by performing the node setting step, the vector setting step, the reference tangent vector setting step, the final tangent vector setting step, the angles calculating step and the angles adding step; and

calculating a rotation angle having the rotation direction at the measuring point in a case that the wire harness is deformed from the first shape to the second shape based on the first and second rotation angles.

6. (original): The rotation angle calculating method as set forth in claim 1, wherein the plurality of nodes are set on a center line of the wire harness.

7. (original): The rotation angle calculating method as set forth in claim 1, wherein a distance between the adjoining nodes is set as following formula; wherein,

the distance R is smaller than $\pi \cdot d/2$; and

"d" is a diameter of the wire harness.

8. (previously presented): A computer-readable recording medium, which causes a computer to execute the rotation angle calculating method as set forth in claim 1.

9. (currently amended): A rotation angle calculating apparatus for calculating a rotation angle of the wire harness at an arbitrary measuring point of the wire harness when the wire harness is deformed from a first shape to a second shape while a fixed point of the wire harness is fixed, the rotation angle calculating apparatus, comprising:

a node setting unit, which sets a plurality of intermediate points between the fixed point and the measuring point of the wire harness in the second shape, wherein the fixed point, the measuring point and the intermediate points are set as nodes respectively;

a node vector setting unit, which sets vectors tangent to the wire harness at the nodes of the wire harness in the second shape as node vectors respectively;

an angles calculating unit, which calculates angles, each of which has a rotation direction, wherein each of the angles is defined between the vectors at the adjoining nodes; and

an angles adding unit, which adds the angles to each other so as to calculate a rotation angle having a rotation direction at the measuring point.

10. (previously presented): A computer-readable recording medium, which causes a computer to execute the rotation angle calculating method as set forth in claim 2.

11. (previously presented) A computer-readable recording medium, which causes a computer to execute the rotation angle calculating method as set forth in claim 3.

12. (previously presented): A computer-readable recording medium, which causes a computer to execute the rotation angle calculating method as set forth in claim 4.

13. (previously presented): A computer-readable recording medium, which causes a computer to execute the rotation angle calculating method as set forth in claim 5.

14. (previously presented): A computer-readable recording medium, which causes a computer to execute the rotation angle calculating method as set forth in claim 6.

15. (previously presented): A computer-readable recording medium, which causes a computer to execute the rotation angle calculating method as set forth in claim 7.